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EXAMINER	
CHACKO DAVIS, DABORAH	

ART UNIT	PAPER NUMBER
1756	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

ℍ✓

Office Action Summary	**Application No.** 10/681,030	**Applicant(s)** BORODOVSKY, YAN	
	Examiner Daborah Chacko-Davis	**Art Unit** 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 December 2006*.
2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-18 and 30-37* is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *11-18, 19-37* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 11, and 37, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claim 11, at line 14, and claim 37, at line 13, recite the limitation "the formerly periodic pattern". There is insufficient antecedent basis for this limitation in the claims.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 11-13, 16-17, and 36-37, are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent No. 5,415,835 (Brueck et al., hereinafter referred to as Brueck).

Brueck, in the abstract, in col 2, lines 38-61, in col 6, lines 30-41, discloses irradiating the photoresist layer by interferometric lithography to form a line and space pattern that has a first line width and a pitch of about half the wavelength ($\lambda/2$) on the photoresist layer (first photoresist), exposing the resulting line and space pattern to a second exposure means (masked exposure) to form features that have a second line width, wherein the second line width is greater than the first line width (see figures 16 thru 19), and the pitch of the feature formed is about twice the pitch of the interference pattern (line and space pattern formed by interferometric lithography). Brueck, in col 4, lines 31-40, discloses that after the subsequent pattern is developed, a second photoresist is coated over the developed photoresist layer, followed by another exposure process to form a third pattern (third pattern width), the third pattern is greater than the first pattern width (see figures 16, 17, and 8). Brueck, in col 4, lines 53-67, in col 5, lines 1-5, that the pattern (developed second photoresist pattern, and the pattern from the first photoresist used as a guide) is translated into a grating structure via etching into the support structure (silicon substrate, line and space pattern) (claims 11-13, and 36-37). Brueck, in col 2, lines 62-68, in col 3, lines 1-2, in col 4, lines 30-41, discloses that the alignment system is employed that aligns the second photoresist layer (third pattern) to the feature and the interference pattern (claims 16-17).

6. Claims 30-34, are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent Application Publication No. 2002/0078427 (Palmer et al., hereinafter referred to as Palmer).

Palmer, in the abstract, in [0001], [0005], [0006], [0007], [0024], discloses providing a theoretical mask layout data, creating a mask design layout to form a contoured data set (line and space pattern for integrated circuit etc), subtracting the theoretical mask data set from the contoured data set to obtain a desired mask layout (remainder layout forms the print mask) (claims 30, and 33). Palmer, in [0020], discloses that the aligning the original (theoretical) mask layout (design layout) with the contoured mask data (claim 31). Palmer, in [0024], and in claims 1, 5, and 6, discloses generating a data (remainder layout data) that can be implemented to form a mask (claim 32). Palmer, in [0022], and [0023], discloses that the desired layout (adjusted by Boolean operation) can be resized (reduced in size or overstated in size) (claim 34).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 14, and 15, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,415,835 (Brueck et al., hereinafter referred to as Brueck) in view of U. S. Patent No. 4,517,280 (Okamoto et al, hereinafter referred to as Okamoto).

Brueck, is discussed in paragraph no. 5.

The difference between the claims and Brueck is that Brueck does not disclose that the second photoresist is chemically distinct from the first photoresist (claim 14). Brueck does not disclose a third barrier layer residing between the first and second photoresists, that has high absorption of light to expose the first photoresist and chemical structure that prevents the mixing of the first and second photoresist (claim 15).

Okamoto, in col 3, lines 10-64, discloses forming a first photoresist pattern (from a first photoresist material), after the developing process, a second photoresist material different chemically from the first photoresist material is formed on the first photoresist pattern, enabling the presence of a barrier layer between the first photoresist material pattern and the second photoresist layer (barrier layer forms on the surface of the first photoresist pattern due to exposure to native oxides, developing solutions etc, and has high absorption of light), and preventing the mixing of the first photoresist pattern material and the second photoresist material layer. Okamoto, col 3, lines 26-44, discloses that the mask (barrier layer) placed in contact with the first and second photoresist also prevents exposure to the fist photoresist.

Therefore, it would be obvious to a skilled artisan to modify Brueck by employing the method of Okamoto to coat the substrate with two different resist materials because Okamoto, in col 3, lines 25-33, discloses that using a second different photoresist material on the first photoresist pattern enables the removal of only that part of the second photoresist where the diffraction grating is to be formed while leaving the other part in tact, and in col 4, lines 1-5, discloses that also the choice of a different second photoresist material can also be tailored to prevent the grating pattern of the first photoresist from being thermally deformed during subsequent processing steps.

9. Claim 18, is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,415,835 (Brueck et al., hereinafter referred to as Brueck) in view of U. S.

Patent Application Publication No. 2002/0078427 (Palmer et al., hereinafter referred to as Palmer).

Brueck is discussed in paragraph no. 5.

The difference between the claims and Brueck is that Brueck does not disclose that the print mask is generated by subtracting the final design layout from the interference pattern (claim 18).

Palmer in [0006], [0007], [0022], [0023], and in figure 6, discloses that a subtraction of the bounded contour (final design layout) and the initial input (interference pattern) is performed to obtain the desired mask layout.

Therefore, it would be obvious to a skilled artisan to modify Brueck by performing a subtraction to the initial input mask data and the bounded data set as suggested by Palmer because Palmer in [0023], discloses that performing a Boolean operation enables the designer to adjust the original layout or adjust the proximity correction attributable to a particular feature that is otherwise overstated in size by too large of a degree or reduced in size or completely omitted.

10. Claim 35, is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0078427 (Palmer et al., hereinafter referred to as Palmer) in view of U. S. Patent No. 5,415,835 (Brueck et al., hereinafter referred to as Brueck).

Palmer is discussed in paragraph no. 3.

The difference between the claims and Palmer is that Palmer does not disclose that the pattern layout is produced by interference lithography.

Brueck, in col 2, lines 38-55, discloses that pattern layout is imparted using interference lithography.

Therefore, it would be obvious to a skilled artisan to modify Palmer by employing the interferometric lithography suggested by Brueck to produce a pattern layout because Brueck, in col 2, lines 48-56, and in col 3, lines 20-27, discloses that using interferometric lithography enables the production of the extreme submicrometer structures and flexible interconnect technology needed to produce useful structures.

Response to Arguments

11. Applicant's arguments filed December 8, 2006, have been fully considered but they are not persuasive. The 102 and 103 rejections made in the previous office action are maintained.

A) Applicants argue that Brueck does disclose the formation of a second photoresist on the first photoresist as claimed.

Brueck, in col 4, lines 30-45, discloses that after the first photoresist pattern is developed and transferred, a second photoresist is coated over it. Brueck does not strip the first photoresist pattern prior to coating the second photoresist.

B) Applicants argue that Brueck does not disclose that both the first photoresist and second photoresist is used as a guide for etching.

Brueck, in col 4, lines 20-67, in col 5, lines 1-5, discloses that after the patterning by developed and etching of the substrate using the first photoresist pattern, and then recoating the first resist pattern with a second photoresist that is further exposed, and developed to form a pattern, an etch process can be performed to transfer the pattern to the silicon substrate (support). Therefore both the first photoresist and second photoresist patterns are used as guide for etching.

C) Applicants argue that Palmer does not include subtracting a design layout form a pattern layout.

Palmer, in [0023], discloses using a subtraction process prior to forming a final pattern layout.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd

March 5, 2007.

MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700